No. 200300114

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Virginia Tech Intellectual Properties, Inc.

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED DISTINCT VARIETY OF SEXUALLY REPRODUCED, OR TUBER PROPAGATED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF TWENTY YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY. OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR IMPORTING IT, OR EXPORTING IT, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSE , OR USING IT IN ODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY TECTION ACT. IN THE UNITED STATES SEED OF THIS VARIETY (1) SHALL BE SOLD BY VARIETY NAME ONLY AS A CERTIFIED SEED AND (2) SHALL CONFORM TO THE NUMBER OF GENERATIONS SPECIFIED BY THE OWNER OF S. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

WHEAT, COMMON

'Pearl'

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this twenty fourth day of June, in the year two thousand three.

Attest:

Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

...tary of Agriculture

01.053

REPRODUCE LOCALLY. ***Include form number and date on all reproductions***

Form Approved - OMB No. 0581-0055

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY - PLANT VARIETY PROTECTION OFFICE

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE

(Instructions and information collection burden statement on reverse)

The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF OWNER
Virginia Tech Intellectual Properties, Inc.

2. TEMPORARY DESIGNATION OR EXPERIMENTAL NAME
VA96W-403WS

3. VARIETY NAME
Pearl

4. ADDRESS *(Street and No., or R.F.D. No., City, State, and ZIP Code, and Country)*
Virginia Tech Intellectual Properties, Inc.
1872 Pratt Dr., Ste. 1625
Blacksburg, VA 24060

5. TELEPHONE *(include area code)*
540/951-9378

6. FAX *(include area code)*
540/951-5292

FOR OFFICIAL USE ONLY

PVPO NUMBER
200300114

FILING DATE
1-30-2003

7. IF THE OWNER NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION *(corporation, partnership, association, etc.)*
Corporation

8. IF INCORPORATED, GIVE STATE OF INCORPORATION
Virginia

9. DATE OF INCORPORATION
June 20, 1985

10. NAME AND ADDRESS OF OWNER REPRESENTATIVE(S) TO SERVE IN THIS APPLICATION. *(First person listed will receive all papers)*
Carl A. Griffey
Crop and Soil Environmental Sciences
Virginia Tech
Blacksburg, VA 24061-0404

FEES RECEIVED

FILING AND EXAMINATION FEES:
$ 2705.00
DATE 1-30-2003

CERTIFICATION FEE:
$ 432.00
DATE 6/2/03

11. TELEPHONE *(Include area code)*
540/231-9789

12. FAX *(Include area code)*
540/231-3431

13. E-MAIL
cgriffey@vt.edu

14. CROP KIND *(Common Name)*
Wheat, Common

15. GENUS AND SPECIES NAME OF CROP
Triticum aestivum

16. FAMILY NAME *(Botanical)*
Triticeae

17. IS THE VARIETY A FIRST GENERATION HYBRID?
☐ YES ☒ NO

18. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow instructions on reverse)

a. ☒ Exhibit A. Origin and Breeding History of the Variety
b. ☒ Exhibit B. Statement of Distinctness
c. ☒ Exhibit C. Objective Description of Variety
d. ☐ Exhibit D. Additional Description of the Variety *(Optional)*
e. ☒ Exhibit E. Statement of the Basis of the Owner's Ownership
f. ☒ Voucher Sample *(2,500 viable untreated seeds or, for tuber propagated varieties, verification that tissue culture will be deposited and maintained in an approved public repository)*
g. ☐ Filing and Examination Fee ($2,705), made payable to "Treasurer of the United States" *(Mail to the Plant Variety Protection Office)*

19. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE SOLD AS A CLASS OF CERTIFIED SEED? *See Section 83(a) of the Plant Variety Protection Act)*
☒ YES *(If "yes", answer items 20 and 21 below)* ☐ NO *(If "no", go to item 22)*

20. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF CLASSES? ☒ YES ☐ NO
IF YES, WHICH CLASSES? ☒ FOUNDATION ☐ REGISTERED ☒ CERTIFIED

21. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS? ☐ YES ☒ NO
IF YES, SPECIFY THE NUMBER 1,2,3, *etc.* ☐ FOUNDATION ☐ REGISTERED ☐ CERTIFIED
(If additional explanation is necessary, please use the space indicated on the reverse.)

22. HAS THE VARIETY (INCLUDING ANY HARVESTED MATERIAL) OR A HYBRID PRODUCED FROM THIS VARIETY BEEN SOLD, DISPOSED OF, TRANSFERRED, OR USED IN THE U. S. OR OTHER COUNTRIES?
☒ YES ☐ NO
IF YES, YOU MUST PROVIDE THE DATE OF FIRST SALE, DISPOSITION, TRANSFER, OR USE FOR EACH COUNTRY AND THE CIRCUMSTANCES. *(Please use space indicated on reverse.)*

23. IS THE VARIETY OR ANY COMPONENT OF THE VARIETY PROTECTED BY INTELLECTUAL PROPERTY RIGHT *(PLANT BREEDER'S RIGHT OR PATENT)*?
☐ YES ☒ NO
IF YES, PLEASE GIVE COUNTRY, DATE OF FILING OR ISSUANCE AND ASSIGNED REFERENCE NUMBER. *(Please use space indicated on reverse.)*

24. The owners declare that a viable sample of basic seed of the variety will be furnished with application and will be replenished upon request in accordance with such regulations as may be applicable, or for a tuber propagated variety a tissue culture will be deposited in a public repository and maintained for the duration of the certificate.

The undersigned owner(s) is(are) the owner of this sexually reproduced or tuber propagated plant variety, and believe(s) that the variety is new, distinct, uniform, and stable as required in Section 42, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act.

Owner(s) is(are) informed that false representation herein can jeopardize protection and result in penalties.

SIGNATURE OF OWNER	SIGNATURE OF OWNER
Michael J. Martin	
NAME *(Please print or type)* Michael J. Martin	NAME *(Please print or type)*
CAPACITY OR TITLE Executive Vice President	CAPACITY OR TITLE
DATE 4/2/03	DATE

S&T-470 (07-01) designed by the Plant Variety Protection Office with WordPerfect 9.0. Replaces STD-470 (04-01) which is obsolete. *(See reverse for instructions and information collection burden statement)*

1

INSTRUCTIONS

20030014

GENERAL: To be effectively filed with the Plant Variety Protection Office (PVPO), **ALL** of the following items must be received in the PVPO: (1) completed application form signed by the owner; (2) completed exhibits A, B, C, E; (3) for a seed reproduced variety at least 2,500 viable untreated seeds, for a hybrid variety at least 2,500 untreated seeds of each line necessary to **reproduce** the variety, or for tuber reproduced varieties verification that a viable *(in the sense that it will reproduce an entire plant)* tissue culture will be deposited and maintained in an approved public repository; (4) check drawn on a U.S. bank for $2,450 ($300 filing fee and $2,150 examination fee), payable to "Treasurer of the United States" *(See Section 97.6 of the Regulations and Rules of Practice.)* Partial applications will be held in the PVPO for not more than 90 days, then returned to the applicant as unfiled. Mail application and other requirements to Plant Variety Protection Office, AMS, USDA, Room 500, NAL Building, 10301 Baltimore Avenue, Beltsville, MD 20705-2351. Retain one copy for your files. All items on the face of the application are self explanatory unless noted below. Corrections on the application form and exhibits must be initialed and dated. **DO NOT** use masking materials to make corrections. If a certificate is allowed, you will be requested to send a check payable to "Treasurer of the United States" in the amount of $300 for issuance of the certificate. Certificates will be issued to owner, not licensee or agent.

Plant Variety Protection Office
Telephone: (301) 504-5518
FAX: (301) 504-5291
Homepage: http://www.ams.usda.gov/science/pvp.htm

ITEM

18a. Give: (1) the genealogy, including public and commercial varieties, lines, or clones used, and the breeding method;
(2) the details of subsequent stages of selection and multiplication;
(3) evidence of uniformity and stability; and
(4) the type and frequency of variants during reproduction and multiplication and state how these variants may be identified

18b. Give a summary of the variety's distinctness. Clearly state how this application variety may be distinguished from all other varieties in the same crop. If the new variety is most similar to one variety or a group of related varieties:

(1) identify these varieties and state all differences objectively;
(2) attach statistical data for characters expressed numerically and demonstrate that these are clear differences; and
(3) submit, if helpful, seed and plant specimens or photographs (prints) of seed and plant comparisons which clearly indicate distinctness.

18c. Exhibit C forms are available from the PVPO Office for most crops; specify crop kind. Fill in Exhibit C (Objective Description of Variety) form as completely as possible to describe your variety.

18d. Optional additional characteristics and/or photographs. Describe any additional characteristics that cannot be accurately conveyed in Exhibit C. Use comparative varieties as is necessary to reveal more accurately the characteristics that are difficult to describe, such as plant habit, plant color, disease resistance, *etc.*

18e. Section 52(5) of the Act requires applicants to furnish a statement of the basis of the applicant's ownership. An Exhibit E form is available from the PVPO.

19. If "Yes" is specified *(seed of this variety be sold by variety name only, as a class of certified seed)*, the applicant **MAY NOT** reverse this affirmative decision after the variety has been sold and so labeled, the decision published, or the certificate issued. However, if "No" has been specified, the applicant may change the choice. *(See Regulations and Rules of Practice, Section 97.103).*

21. *See Section 83 of the Act for the Contents and Term of Plant Variety Protection.*

22. *See Sections 41, 42, and 43 of the Act and Section 97.5 of the regulations for eligibility requirements.*

23. *See Section 5.5 of the Act for instructions on claiming the benefit of an earlier filing date.*

21. CONTINUED FROM FRONT *(Please provide a statement as to the limitation and sequence of generations that may be certified.)*

22. CONTINUED FROM FRONT *(Please provide the date of first sale, disposition, transfer, or use for each country and the circumstances, if the variety (including any harvested material) or a hybrid produced from this variety has been sold, disposed of, transferred, or used in the U.S. or other countries.)*

Foundation seed of Pearl was first sold to seedsmen fall 2002. Foundation and Certified seed will be sold in fall 2003 in the USA.

23. CONTINUED FROM FRONT *(Please give the country, date of filing or issuance, and assigned reference number, if the variety or any component of the variety is protected by intellectual property right (Plant Breeder's Right or Patent).)*

NOTES: It is the responsibility of the applicant/owner to keep the PVPO informed of any changes of address or change of ownership or assignment or owner's representative during the life of the application/certificate. There is no charge for filing a change of address. The fee for filing a change of ownership or assignment or any modification of owner's name is specified in Section 97.175 of the regulations. *(See Section 101 of the Act, and Sections 97.130, 97.131, 97.175(h) of the Regulations and Rules of Practice.)*

To avoid conflict with other variety names in use, the applicant must check the variety names proposed by contacting: Seed Branch, AMS, USDA, Room 213, Building 306, Beltsville Agricultural Research Center--East, Beltsville, MD 20705. Telephone: (301) 504-8089.

S&T-470 (2-99) designed by the Plant Variety Protection Office with WordPerfect 6.0a. Replaces STD-470 (6-98) which is obsolete.

Pearl (VA96W-403WS) Wheat

14A. Exhibit A: Origin and Breeding History

Genealogy and Breeding Method. The wheat cultivar Pearl (formerly designated as VA96W-403WS) was derived from the cross VA90-22-12/'Coker 9803'. Parentage of VA90-22-12 is 'Tyler'*2/'Coker 78-23'. The cross was made in spring 1990, and the F_1 generation was grown in the field as a single 4ft headrow in 1991 to produce F_2 seed. The population was advanced from the F_2 to F_5 generation using a modified bulk breeding method.

Population Advancement and Selection of the Variety. Wheat spikes were selected from the population in each segregating generation (F_2 to F_5) on the basis of absence of obvious disease, early maturity, short straw and desirable head shape and size. Selected spikes were threshed in bulk, and the seed was planted in a 225ft^2 block in the fall of each year. Spikes selected from the F_5 bulk were threshed individually and planted in separate 4ft headrows. One of the selected F_6 headrows harvested in 1995 was heterogeneous for seed color and contained both red and white seed. White seed were visually selected from this heterogeneous seed bulk. The resulting F_7 white seed composite was planted in 36 four-foot headrows and harvested in bulk. This seed source was used in subsequent tests and in the development of an initial source of Breeder Seed. The line was tested as entry 403 in non-replicated observation tests in 1996-97 and was designated VA96W-403WS. This line was tested in replicated advanced tests in 1998 and in the Virginia Variety Trials in 1999 and 2000.

Multiplication and Purification. In fall 1998, a 0.2 acre F_9 purification block of Pearl was planted at the Eastern Virginia AREC and visually-apparent variant plant types were removed. This block was harvested in bulk and produced approximately 5 bu of pre-Breeder Seed of Pearl. A portion of this seed was used to plant a two acre F_{10} increase of Pearl at the VCIA Foundation Seed Farm in fall 1999, which produced about 175 bu of Breeder Seed. Of this seed lot, 25 bu were delivered to the Michigan Foundation Seed Farm, where10 acres of Pearl (F_{11} generation) were planted fall 2000. Subsequently Michigan Foundation Seed Farm planted 65 acres of Pearl Breeder seed in 2001 and 700 acres in 2002. While Pearl has remained stable and uniform in composition through the last four generations of self pollination, the initial Breeder seed contained the following proportion of variants: up to 1.0% taller plants, 0.5% plants with longer awns, 0.5% plants with bronze colored glumes, 0.5% shorter plants, and 1.2% red kernels.

A purer source of Pearl Breeder seed was developed in 2001. In the 1999-2000 season 320 F_{10} headrows of Pearl were planted and evaluated for purity and trueness of type. Variant rows were removed and the remaining rows were harvested individually and evaluated for seed color. Only rows having all white seed were saved. In fall 2000, seed from 190 selected headrows were planted individually in standard 45 ft^2 yield plots, evaluated for purity and trueness of type, harvested individually, and evaluated for seed color. Seed from 78 selected plots having all white seed were bulked to form an improved source of Pearl Breeder Seed.

Pearl (VA96W-403WS) Wheat

14B. Exhibit B: Novelty Statement

Pearl wheat is uniquely different from all known cultivars. Among cultivars which Pearl has been tested with, 'Madison' is most similar. Seed of Pearl is white with an Ivory Phenol reaction, while seed of Madison is red with a Brown Phenol reaction. Madison is resistant to Hessian fly biotype GP, while Pearl is susceptible. Madison has genes *Lr*10 and *Lr*11 governing resistance to leaf rust (*Puccinia triticina*). Pearl does not possess gene *Lr*10. Madison is susceptible to race MCGL (virulence for genes *Lr*1, 3, 10, 11, 26) while Pearl is resistant; whereas, Madison is resistant to race TLGG (virulence for genes *Lr*1, 2a, 2c, 3, 9, 11, 18) and Pearl is susceptible. Madison is resistant to stem rust (*Puccinia graminis*) race TPMK, while Pearl is susceptible.

FORM APPROVED: OMB NO. 0581-0055

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
LIVESTOCK AND SEED DIVISION
BELTSVILLE, MARYLAND 20705

EXHIBIT C
(Wheat)

OBJECTIVE DESCRIPTION OF VARIETY
WHEAT (*TRITICUM SPP.*)

INSTRUCTIONS: *See Reverse.*

NAME OF APPLICANT(S)
Virginia Tech Intellectual Properties, Inc.

ADDRESS (*Street and No. or R.F.D. No., City, State, and ZIP Code*)
1872 Pratt Dr., Suite 1625
Blacksburg, VA 24060

FOR OFFICIAL USE ONLY
PVPO NUMBER 200300114
VARIETY NAME OR TEMPORARY DESIGNATION
Pearl

Place the appropriate number that describes the varietal character of this variety in the boxes below.
Place a zero in first box (e.g. [0][8][9] or [0][9]) when number is either 99 or less or 9 or less.

1. KIND:
[1] 1 = COMMON 2 = DURUM 3 = EMMER 4 = SPELT 5 = POLISH 6 = POULARD 7 = CLUB

2. TYPE:
[2] 1 = SPRING 2 = WINTER 3 = OTHER (*Specify*) _____
[1] 1 = SOFT 2 = HARD 3 = OTHER (*Specify*) _____
[1] 1 = WHITE 2 = RED 3 = OTHER (*Specify*) _____

3. SEASON - NUMBER OF DAYS FROM EMERGENCE TO:
[ ][ ][ ] FIRST FLOWERING
[ ][ ][ ] LAST FLOWERING

4. MATURITY (*50% Flowering*):
[0][1] NO. OF DAYS *EARLIER* THAN ..... [7] 1 = ARTHUR 2 = SCOUT 3 = CHRIS
[0][1] NO. OF DAYS *LATER* THAN ..... [8] 4 = LEMHI 5 = NUGAINES 6 = LEEDS
7=Harus 8=Roane

5. PLANT HEIGHT (*From soil level to top of head*):
[0][9][4] CM. HIGH
[0][9] CM. TALLER THAN ..... [8] 7=Harus 8=Roane
[1][3] CM. SHORTER THAN ..... [7] 1 = ARTHUR 2 = SCOUT 3 = CHRIS 4 = LEMHI 5 = NUGAINES 6 = LEEDS

6. PLANT COLOR AT BOOTING (*See reverse*):
[2] 1 = YELLOW GREEN 2 = GREEN 3 = BLUE GREEN

7. ANTHER COLOR:
[1] 1 = YELLOW 2 = PURPLE

8. STEM:
[1] Anthocyanin: 1 = ABSENT 2 = PRESENT
[2] Waxy bloom: 1 = ABSENT 2 = PRESENT
[2] Hairiness of last internode of rachis: 1 = ABSENT 2 = PRESENT
[1] Internodes: 1 = HOLLOW 2 = SOLID
[0][4] NO. OF NODES (*Originating from node above ground*)
[2][3] CM. INTERNODE LENGTH BETWEEN FLAG LEAF AND LEAF BELOW

9. AURICLES:
[1] Anthocyanin: 1 = ABSENT 2 = PRESENT
[2] Hairiness: 1 = ABSENT 2 = PRESENT

10. LEAF:
[1] Flag leaf at booting stage: 1 = ERECT 2 = RECURVED 3 = OTHER (*Specify*): _____
[1] Flag leaf: 1 = NOT TWISTED 2 = TWISTED
[2] Hairs of first leaf sheath: 1 = ABSENT 2 = PRESENT
[2] Waxy bloom of flag leaf sheath: 1 = ABSENT 2 = PRESENT
[1][0] MM. LEAF WIDTH (*First leaf below flag leaf*)
[2][2] CM. LEAF LENGTH (*First leaf below flag leaf*):

FORM LMGS 470-6 (6-82) (Formerly Form LPGS 470-6 (3-79), which may be used)

20030014

11. HEAD:

[1] Density: 1 = LAX 2 = DENSE

[1] Shape: 1 = TAPERING 2 = STRAP 3 = CLAVATE 4 = OTHER (Specify) _____

[2] Awnedness: 1 = AWNLESS 2 = APICALLY AWNLETED 3 = AWNLETED 4 = AWNED

[2] Color at maturity: 1 = WHITE 2 = YELLOW 3 = PINK 4 = RED 5 = BROWN 6 = BLACK 7 = OTHER (Specify): _____

[0][8] CM. LENGTH

[1][3] MM. WIDTH

12. GLUMES AT MATURITY:

[3] Length: 1 = SHORT (CA. 7 mm.) 2 = MEDIUM (CA. 8 mm.) 3 = LONG (CA. 9 mm.)

[3] Width: 1 = NARROW (CA. 3 mm.) 2 = MEDIUM (CA. 3.5 mm.) 3 = WIDE (CA. 4 mm.)

[2] Shoulder shape: 1 = WANTING 2 = OBLIQUE 3 = ROUNDED 4 = SQUARE 5 = ELEVATED 6 = APICULATE

[2] Beak: 1 = OBTUSE 2 = ACUTE 3 = ACUMINATE

13. COLEOPTILE COLOR:

[2] 1 = WHITE 2 = RED 3 = PURPLE

14. SEEDLING ANTHOCYANIN:

[1] 1 = ABSENT 2 = PRESENT

15. JUVENILE PLANT GROWTH HABIT:

[2] 1 = PROSTRATE 2 = SEMI-ERECT 3 = ERECT

16. SEED:

[1] Shape: 1 = OVATE 2 = OVAL 3 = ELLIPTICAL

[1] Cheek: 1 = ROUNDED 2 = ANGULAR

[3] Brush. 1 = SHORT 2 = MEDIUM 3 = LONG

[1] Brush: 1 = NOT COLLARED 2 = COLLARED

[1] Phenol reaction (See instructions): 1 = IVORY 2 = FAWN 3 = LT. BROWN 4 = BROWN 5 = BLACK

[1] Color: 1 = WHITE 2 = AMBER 3 = RED 4 = PURPLE 5 = OTHER (Specify) _____

[0][6] MM. LENGTH

[0][3] MM. WIDTH

[2][9] GM. PER 1000 SEEDS

17. SEED CREASE:

[1] Width: 1 = 60% OR LESS OF KERNEL 'WINOKA' 2 = 80% OR LESS OF KERNEL 'CHRIS' 3 = NEARLY AS WIDE AS KERNEL 'LEMHI'

[3] Depth: 1 = 20% OR LESS OF KERNEL 'SCOUT' 2 = 35% OR LESS OF KERNEL 'CHRIS' 3 = 50% OR LESS OF KERNEL 'LEMHI'

18. DISEASE: (0 = Not Tested, 1 = Susceptible, 2 = Resistant)

[1] STEM RUST (Races) TPMK

[1] LEAF RUST (Races) TLGG

[0] STRIPE RUST (Races) _____

[0] LOOSE SMUT

[2] POWDERY MILDEW

[0] BUNT

[ ] OTHER (Specify) _____

19. INSECT: (0 = Not Tested, 1 = Susceptible, 2 = Resistant)

[0] SAWFLY

[2] APHID (Bydv.)

[0] GREEN BUG

[1] CEREAL LEAF BEETLE

[1] OTHER (Specify) Hessian Fly Biotype L

HESSIAN FLY RACES: [1] GP [0] A [1] B [1] C [1] D [1] E [0] F [0] G

20. INDICATE WHICH VARIETY MOST CLOSELY RESEMBLES THAT SUBMITTED:

CHARACTER	NAME OF VARIETY	CHARACTER	NAME OF VARIETY
Plant tillering		Seed size	
Leaf size		Seed shape	
Leaf color		Coleoptile elongation	
Leaf carriage		Seedling pigmentation	

INSTRUCTIONS

GENERAL: The following publications may be used as a reference aid for the standardization of terms and procedures for completing this form:

(a) L.W. Briggle and L. P. Reitz, 1963, Classification of Triticum Species and Wheat Varieties Grown in the United States, Technical Bulletin 1278, United States Department of Agriculture.

(b) W.E. Walls, 1965, A Standardized Phenol Method for Testing Wheat Seeds for Varietal Purity, contribution No. 28 to the handbook of seed testing prepared by the Association of Official Seed Analysts. (See attachment.)

Pearl (VA96W-403WS) Wheat

14D. Exhibit D: Additional Description of Pearl.

Since Pearl (VA96W-403WS) has not been tested in comparison with any of the six cultivars listed in Exhibit C, average data on performance in Virginia from 1998 to 2000 are presented in Tables 1-5. Pearl is a high-yielding, medium height, apically awnleted, soft white winter wheat. In Virginia, Pearl is a full-season genotype with head emergence being similar to that of 'FFR 555W' and 'Roane' (Tables 1-5). In the northeast (Michigan and New York), Pearl is an early heading genotype with head emergence being 1-3 days earlier than most white wheat genotypes (Tables 6,7). Plant height of Pearl (37 inches) is similar to that of 'Madison'. In the northeast, Pearl is 2-6 inches shorter than most white wheats genotypes except for 'Caledonia' and Pioneer '25W33'. Pearl has moderate straw strength with average lodging scores in Virginia and higher than average scores in the northeast. In Virginia Pearl has produced grain yields (mean of 76 bu/ac) near the test average (75 bu/ac) and test weights (53.3 – 57.3 lb/bu) below the test average and 0.7 lb/bu lower than those of 'Coker 9835', Pioneer '2580' and FFR 555W (Tables 1-5). However, in the northeast, Pearl produced above average grain yields and ranked 3rd (73 bu/ac) among 40 white wheat genotypes in New York and 7th (86 bu/ac) among 19 genotypes in Michigan (Tables 6, 7). Pearl ranked 11th in test weight (63.2 lb/bu) in New York while the average test weight over 40 white wheat genotypes was 62.2 lb/bu. In Michigan, where the average test weight of 19 white wheat genotypes was 57.9 lb/bu, Pearl ranked 7th with a test weight of 58.3 lb/bu. Compared with other white wheat lines, Pearl had average to slightly above average scores (4.9 vs. mean of 4.6 in Michigan and 4.0 vs. 3.6 in New York) for pre-harvest kernel sprouting (0=none to 9=100%). Based on limited data (Table 7), winter-survival (96% in New York) of Pearl (VA96W-403WS) is moderately good. Milling quality of Pearl is very good and similar to that of FFR 555W (Table 8). Baking quality of Pearl is good and most similar to that of FFR 555W.

The older version of Exhibit C which limits disease reaction classes to resistant or susceptible was submitted with this PVP application; however, on the basis of the classifications in the revised Exhibit C, Pearl (VA96W-403WS) exhibits an Intermediate reaction to powdery mildew (*Blumeria graminis*), glume blotch (*Stagonospora nodorum*), barley yellow dwarf virus, and wheat spindle streak mosaic virus. It exhibits an Intermediate to Susceptible reaction to leaf blotch (*Septoria tritici*). It is susceptible to race TLGG of leaf rust (*Puccinia triticina*), race TPMK of stem rust (*Puccinia graminis*), and to Hessian fly biotypes GP, B, C, D, E and L.

Table 1. Two year average yield performance of VA96W-403WS in the Virginia Tech Wheat Tests, 1999 and 2000 harvests.*

Brand/Variety	Coastal Plain Region				Piedmont and Blue Ridge Region				Statewide
	Holland	Painter	Warsaw	Average	Blacksburg	Orange	Shenandoah	Average	Average
	bu/a								
VA96W-403WS	57	88 -	84	77	90	77	64	77	77
USG 3209	65 +	100 +	93 +	87	98 +	83	73 +	85	86 +
PIONEER 2580	61	96	84	81	89	80	68	79	80
ROANE	65 +	88 -	79	78	98 +	79	67	82	80
PIONEER 2643	61	96	84	80	90	74	63	77	79
COKER 9835	62	89 -	83	78	91	77	61	77	78
MADISON	53 -	92	83	77	83 -	80	62	75	76 -
COKER 9663	58	88 -	74 -	74	91	76	61	76	75 -
FFR 555W	50 -	81 -	67 -	66 -	83 -	76	58 -	73	70 -
Location Average	60	95	82	80	90	79	66	79	79
L.S.D. (0.05)	5	5	7	9	6	7	6	8	3
C.V.	9	6	9	22	7	9	10	17	9
Statewide Average	79								

* **Varieties are ordered by descending statewide averages. A plus or minus sign indicates a performance significantly above or below the test average.**

Table 2. Summary of performance of VA96W-403WS in the Virginia Tech Wheat Test, 2000 harvest.*

Brand/Variety	Yield (Bu/A) (7)	Test Weight (Lb) (6)	Date Headed (Mar 31+) (4)	Height (In) (3)	Lodging** (0.2-10) (5)	Powdery Mildew (2)	Leaf Rust (0-9)◊ (2)	Barley Yellow Dwarf (2)
VA96W-403WS	70 -	55.2 -	34 +	41	0.8	1	3	2
USG 3209	83 +	57.3	27 -	36	1.8+	0	5 +	2
VA97W-206	80 +	57.3	32 +	37	1.0	0	3	2
PIONEER 2580(B)	76	56.1 -	28 -	38	0.3 -	0	3	2
PIONEER 2643(B)	75	57.0	29 -	34	0.2 -	0	3	2
ROANE	74	58.8+	33 +	37	0.7	2	3	2
MADISON(B)	71 -	55.5 -	29 -	40	1.2	1	5 +	2
COKER 9835(DA)	70 -	56.2 -	30	35	0.4	1	4	2
COKER 9663(DA)	68 -	57.7+	29 -	43	1.6	3	0 -	2
FFR 555W(B)	63 -	55.3 -	33 +	38	0.3 -	5	6 +	4 +
Test Average	75	56.9	30	38	1.0	1	3	2
L.S.D. (0.05)	3	0.5	1	—	0.7	1	2	1
C.V.	8	1.5	3	3	102.7	87	49	25

* Varieties are ordered by descending statewide averages. A plus or minus sign indicates a performance significantly above or below the test average. The number in parentheses below column headings indicates the number of locations on which data are based.

** Belgian Lodging Scale = Area X Intensity X 0.2. Area = 1-10, where 1 is wheat unaffected and 10 is entire plot affected and Intensity=1-5, where 1 is wheat standing upright and 5 is wheat lying totally flat.

◊The 0-9 ratings indicate relative disease intensity where 0=none and 9=total plant infection.

Table 3. Summary of performance of VA96W-403WS in the Virginia Tech Wheat Test, 1999 harvest.*

Brand/Variety	Yield (Bu/A) (6)	Test Weight (Lb) (6)	Date Headed (Mar 31+) (3)	Height (In) (3)	Lodging✣ (0.2-10) (1)	Powdery Mildew (0-9)❐ (2)	Leaf Rust (0-9) (3)	Septoria♤ (0-9) (2)	Barley Yellow Dwarf (0-9) (2)
VA96W-403WS	79 +	56.0 -	39 +	38	1.2	2	3	3	1 -
USG 3209	85 +	58.4	33 -	34 -	2.6 +	2	2 -	4 +	1 -
ROANE	79 +	60.1 +	39 +	36 -	1.7	1 -	3	1 -	1 -
COKER 9835(D)	78	57.5 -	35 -	35 -	3.0 +	2	7 +	2 -	2
PIONEER 2580(B)	77	57.6 -	33 -	37 -	0.7	2	4 +	3	2
VA96W-56	76	58.1	39 +	38	0.2 -	2	4 +	4 +	1 -
MADISON(B)	75	57.2 -	34 -	39 +	2.0	2	3	3	2
VA96W-391	75	58.7 +	37	37 -	2.6 +	1 -	2 -	2 -	1 -
COKER 9663(D)	74	58.7 +	35 -	42 +	2.2	3 +	0 -	3	1 -
PIONEER 2643(B)	73	58.8 +	34 -	33 -	0.2 -	1 -	4 +	2 -	2
FFR 555W(B)	69 -	57.7 -	40 +	37 -	0.6	5 +	5 +	2 -	4 +
LSD (0.05)	4	0.4	1	1	1.0	1	1	1	1
Test Average	75	58.1	36	38	1.3	2	3	3	2

* Varieties are ordered by descending statewide averages. The number in parentheses below column headings indicates the number of locations on which data are based. A plus or minus sign indicates a performance significantly above or below the test average.

✣ Belgian Lodging Scale = Area X Intensity X 0.2. Area = 1-10, where 1 is wheat is unaffected and 10 is entire plot affected and Intensity = 1-5, where 1 is wheat standing upright and 5 is wheat lying totally flat.

❐ The 0-9 ratings indicate relative disease intensity where 0=none and 9= total plant infection.

♤ Caused by *Stagonospora nodorum*.

Table 4. Summary of performance of VA96W-403WS in the Uniform Mason-Dixon Wheat Test in Virginia, 2000. The number below each column heading indicates the number of locations upon which data are based.

Line	Yield (bu/A)	Test Weight (lbs/bu)	Heading Date (Julian)	Plant Height (in)	Lodging (0.2-10)[1]	Powdery Mildew (0-9)[2]	Leaf Rust (0-9)	BYDV (0-9)	Plant Height on 3/24/00 (in)[3]	Juvenile Plant Growth Habit (0-5)[4]
	2	2	2	2	2	2	1	2	1	1
Coker 9663	81.7	59.5	121	39	2.6	6	0	2	15	1
Agripro Foster	72.5	59.1	125	37	0.9	6	6	3	13	1
Pioneer 2580	86.1	57.8	120	37	0.8	3	5	2	11	1
Roane	85.4	60.5	124	34	0.7	2	5	2	9	0
VA96W-403WS	79.6	57.3	124	38	1.4	2	6	3	12	0
Test Mean	79.7	58.5	122	35	1.2	3	4	2	12	1
LSD	6.7	0.8	3	1	1.0	1	2	2	1	0

[1] Belgian Lodging Scale=area x intensity x 0.2. Area is rated on a scale from 1 (plot unaffected) to 10 (entire plot affected). Intensity is rated on a scale from 1 (plants standing upright) to 5 (plants lying totally flat on the ground).

[2] All 0-9 ratings indicated relative disease severity: 0 = no disease present; 9 = total plant infection.

[3] This height measurement serves as an estimate of spring growth habit.

[4] Juvenile plant growth habit: 0 = prostrate, 5 = very erect.

Table 5. Summary of performance of VA96W-403WS in the Advance Wheat Test in Virginia, 1998. The number below each column heading indicates the number of locations upon which data are based.

Line	Yield (bu/A)	Test Weight (lbs/bu)	Heading Date (Julian)	Plant Height (in)	Lodging (0.2-10)[1]	Powdery Mildew (0-9)[2]	Winter Kill (0-9)
	2	2	2	2	2	2	1
FFR 555W	70	53.5	121	38	0.9	4	0
Pioneer 2580	77	53.3	117	37	1.9	1	0
Massey	63	54.0	121	41	3.6	2	1
Jackson	68	54.7	120	37	3.8	3	1
Coker 9835	57	52.3	120	34	2.9	3	1
VA96-403WS	73	53.3	122	41	2.4	3	0
Test Mean	69	53.5	119	37	2.3	2	1
LSD (0.05)	6	0.8	1	1	1.6	1	1

[1] Belgian Lodging Scale=area x intensity x 0.2. Area is rated on a scale from 1 (plot unaffected) to 10 (entire plot affected). Intensity is rated on a scale from 1 (plants standing upright) to 5 (plants lying totally flat on the ground).

infection.

Table 6. Performance of VA96W-403WS White Wheat in Michigan over Six Locations in 2000

Entry	Yield (Bu/A)	Test Weight (Lbs/Bu)	Sprouting (0-9)	Flowering Date (Julian)	Height (in)	Lodging (0-9)	Leaf Blotch (*S. tritici*) (0-9)	Powdery Mildew (0-9)	Leaf Rust (Flag Leaf Infection:%)
Sisson	95	58.8	2.7	145	36	4.4	4.0	2.3	2.9
Roane	91	60.4	1.6	149	38	3.4	1.1	1.6	0.2
VA96W-403 WS	86	58.3	4.9	150	41	4.4	4.3	1.2	0.2
Caledonia	91	57.3	5.8	151	40	1.4	3.9	3.4	1.5
Pioneer 25W33	91	57.0	1.7	151	38	1.0	4.9	2.2	0.4
AC Ron	87	57.3	5.2	153	47	1.5	2.8	4.0	4.8
Superior	87	56.3	6.5	153	45	1.3	2.2	2.4	4.1
Harus	84	58.0	3.8	153	46	1.7	3.5	2.3	4.8
Bavaria	83	58.8	4.8	153	46	2.2	3.3	4.5	0.8
NY86003-106	79	58.9	3.7	150	44	4.2	3.0	2.2	1.5
NY99024-117	85	58.8	5.6	152	43	1.3	3.3	1.1	2.2
Test Mean	85	58.3	3.4	150	42	2.9	4.1	3.9	2.6
White wheat mean	85	57.9	4.6						
LSD	5.0	0.9	2.1	1.3	1.6	1.7	2.2	1.6	1.5
C.V.	5.2	1.4	30.9	1.3	1.8	28.4	26.0	29.3	39.3

Sisson and Roane are soft red winter wheat cultivars released by Virginia Tech.
All other entries are soft white wheat genotypes.

Table 7. Performance of VA96W-403WS White Wheat in New York over Four Locations in 2000

Entry	Yield (Bu/A)	Test Weight (Lbs/Bu)	Sprouting (0-9)	Heading Date (Julian)	Height (in)	Lodging (0-9)	Virus Symp (0-9)	Head Scab Incidence (%)	Glume Blotch (%)	Winter Survival (%)
Sisson	78	64.6	0.7	149	31	2.3	4.0	4.5	1.5	99
Roane	70	67.6	0.2	153	35	2.5	6.3	3.8	1.8	99
VA96W-403 WS	73	63.2	4.0	155	39	3.3	5.0	3.0	1.0	96
Caledonia	74	61.9	4.1	156	35	2.0	3.3	6.0	19.0	98
Pioneer 25W33	72	62.9	3.1	156	31	0.3	6.0	5.0	5.0	97
AC Ron	67	62.1	3.4	157	44	1.7	4.7	4.0	12.0	97
Superior	57	60.2	2.5	161	41	3.3	5.7	12.0	4.0	97
Harus	69	63.2	3.1	155	43	0.5	4.3	3.0	24.0	98
Bavaria	68	62.6	4.0	157	41	1.8	3.7	11.0	17.0	98
NY86003-106	63	62.6	3.1	156	39	2.0	2.7	3.0	12.0	98
NY99024-117	71	63.4	4.0	157	41	0.3	2.7	3.0	26.0	98
Mean	65	62.2	3.6	156	39	1.8	4.2	6.0	19.0	98

Sisson and Roane are soft red winter wheat cultivars released by Virginia Tech.
All other entries are soft white wheat genotypes.

Table 8. Milling and Baking Quality of VA96W-403WS									
Entry	Milling Score	Milling Grade	Bake Score	Bake Grade	Softness Index Lower is softer	Flour Yield %	Flour Protein %	Water Absorb Lower is best	Cookie Diameter Higher is best
	0 to >100	A to F	0 to >100	A to F					
1999 Crop									
FFR 555W	109.9	A	94.5	C	8	78.9	8.81	51	17.79
Pion 2580	79.8	F	62.1	F	12.34**	75.2**	7.86	54.9	16.90**
Jackson	100	A	75.8	F	9.72	76.8	8.8	54.5	17.36*
Coker 9835	99.1	B	95.2	B	10.38	77	7.26	58.2**	18.08
VA96W-403WS	108	A	92.1	C	8.44	77.6	7.91	53.4	17.69
Entry	Milling Score	Milling Grade	Bake Score	Bake Grade	Softness Score Higher is softer	Flour Yield %	Flour Protein %	Water Absorb Lower is best	Cookie Diameter Higher is best
	0 to >100	A to F	0 to >100	A to F					
2000 Crop									
FFR 555W	106.8	A	102	A	50.5	72.5	10.5	54.78*	17.83
Pion 2580	99.4	B	69.5	F	48	70.1	9.85	58.84**	16.92**
Jackson	105.3	A	76.9	F	53.1	70.3	10.61	57.14**	16.9**
Coker 9835	104.4	A	73.3	F	58.2	70.2	10.14	61.10**	17.24*
VA96W-403WS	107.1	A	99.1	B	53.2	70.9	9.95	55.94**	17.86

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE

EXHIBIT E
STATEMENT OF THE BASIS OF OWNERSHIP

The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF APPLICANT(S)	2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER	3. VARIETY NAME
Virginia Tech Intellectual Properties, Inc.	VA96W-403WS	Pearl

4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP, and Country)	5. TELEPHONE (include area code)	6. FAX (include area code)
1872 Pratt Dr., Suite 1625 Blacksburg, VA 24060	540-951-9374	540-951-5292

7. PVPO NUMBER 20030114

8. Does the applicant own all rights to the variety? *Mark an "X" in appropriate block.* If no, please explain. [X] YES [ ] NO

9. Is the applicant (individual or company) a U.S. national or U.S. based company? [X] YES [ ] NO
If no, give name of country

10. Is the applicant the original owner? [ ] YES [X] NO *If no, please answer one of the following:*

a. If original rights to variety were owned by individual(s), is (are) the original owner(s) a U.S. national(s)?

[ ] YES [ ] NO If no, give name of country

b. If original rights to variety were owned by a company(ies), is(are) the original owner(s) a U.S. based company?

[X] YES [ ] NO If no, give name of country

11. Additional explanation on ownership *(if needed, use reverse for extra space)*:

Original owner Virginia Polytechnic Institute and State University assigned its ownership to current owner Virginia Tech Intellectual Properties Inc. (see attached)

PLEASE NOTE:

Plant variety protection can be afforded only to owners (not licensees) who meet one of the following criteria:

1. If the rights to the variety are owned by the original breeder, that person must be a U.S. national, national of a UPOV member country, or national of a country which affords similar protection to nationals of the U.S. for the same genus and species.

2. If the rights to the variety are owned by the company which employed the original breeder(s), the company must be U.S. based, owned by nationals of a UPOV member country, or owned by nationals of a country which affords similar protection to nationals of the U.S. for the same genus and species.

3. If the applicant is an owner who is not the original owner, both the original owner and the applicant must meet one of the above criteria.

The original breeder/owner may be the individual or company who directed final breeding. See Section 41(a)(2) of the Plant Variety Protection Act for definition.

STD-470-E (07-97) *(Destroy previous editions).*
Electronic version designed using WordPerfect InForms by USDA-AMS-MB.

GERMPLASM GROUP ASSIGNMENT

01.053	VA96W-403WS
01.054	VA97W-206
01.055	VA96W-56
01.056	VA96-54-372
01.057	VA96W-391

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY (hereinafter referred to as the "UNIVERSITY"), assigns to VIRGINIA TECH INTELLECTUAL PROPERTIES, INC. (hereinafter referred to as "VTIP") all rights, title and interest in and to all of the above-listed GERMPLASMS as held by the UNIVERISTY.

The UNIVERSITY, by its authorized agents, agrees that it will execute all necessary assignments as requested by VTIP, to facilitate the filing of patent applications and/or copyright registrations. It will render any reasonable assistance requested to aid in preparation of such applications and/or registrations.

The UNIVERSITY shall retain the right to make use of the GERMPLASMS for internal research and other non-commercial purposes without cost to the UNIVERSITY.

All royalties, rents, payments, or any cash receipts from the sale, assignment, transfer, licensing or use of the GERMPLASMS shall be the property of VTIP and shall be distributed according to the provisions of the Virginia Agricultural Experiment Station (VAES) Plant Germplasm Release Policy (PGRP).

Prior to the execution of this Assignment, the UNIVERSITY has not granted the right of license to make, use, or sell said GERMPLASM to anyone except to VTIP, nor has it otherwise encumbered its rights, title and interest in said GERMPLASM, and it will not execute any instrument in conflict with this Assignment.

IN WITNESS WHEREOF, the UNIVERSITY has caused this Assignment to be signed this 4th day of June, 2001.

VIRGINIA POLYTECHNIC INSTITUTE
AND STATE UNIVERSITY

BY _____
MINNIS E. RIDENOUR
Chief Operating Officer

200300114

STATE OF VIRGINIA

COUNTY OF MONTGOMERY, to-wit:

The foregoing instrument was acknowledged before me this 4TH day of JUNE, 2001, by MINNIS E. RIDENOUR, COO of Virginia Polytechnic Institute and State University, on behalf of said University.

Notary Public

My commission expires: 12/31/04